

ABSTRACT

A thermocoustic device includes a housing with a thermal core supported in the housing and having a first and a second surface. The thermal core includes a first heat exchanger defining the first surface of the thermal core and a second heat exchanger defining the second surface of the thermal core. A main chamber is in fluid communication with the first surface of the thermal core and a secondary multiplier chamber is in fluid communication with the second surface of the thermal core. A working volume of a gaseous working fluid fills the main chamber, the multiplier chamber, and the thermal core at a pressure. An equilibrium pressure is defined as the pressure of the working volume of gaseous working fluids with the thermoacoustic device is in a non-operating mode. The main chamber includes a first oscillating member that is operable when the thermoacoustic device is in an operating mode to oscillate such that the pressure in both the main chamber and in the multiplier chamber is oscillated between a peak pressure greater than the equilibrium pressure and a minimum pressure less than the equilibrium pressure. A main pressure amplitude is defined as one-half of the difference between the peak pressure and the minimum pressure in the main chamber. The secondary multiplier chamber includes a second oscillating member that is operable when the thermoacoustic device is in the operating mode to oscillate such that the pressure in the multiplier chamber is oscillated between a peak pressure greater than the equilibrium pressure and a minimum pressure less than the equilibrium pressure. A multiplier pressure amplitude is defined as one-half of the difference between the peak pressure and the minimum pressure in the multiplier chamber. The first and second oscillating members oscillate at substantially the same frequency and such that the pressure oscillations in the main chamber and the multiplier chamber are substantially in phase with each other. The multiplier pressure amplitude is greater than the main pressure amplitude.